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Fig. 13. On a Caucasian Alpine Meadow
Campanula tridentata, Alchemilla, and
(flower, lower right) *Saxifraga sibirica*

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THE ASSOCIATES OF THE MORRIS ARBORETUM

The ASSOCIATES, through whose interest and generosity this *Bulletin* and certain other undertakings of the Arboretum are made possible, is an informal group of individuals interested in encouraging and furthering the educational and research endeavors of the Morris Arboretum. Further information concerning this organization will be sent on request.

A GIFT WEATHERVANE

Latest addition to the new Laboratory and Service Building adjacent to the greenhouses—and one which greatly improves its appearance—is an excellently finished steel weathervane, personally made and presented to the Arboretum by Mr. Thomas Williams of Dravosburg, Penna.

When visiting the Arboretum a year ago Mr. Williams recognized the need for a detail of this sort to improve the appearance of the small, central, ventilating tower. He accordingly acquired materials and set to work with the result as illustrated in the accompanying figure. The design is essentially a reproduction of a Colonial weathervane, with the addition of a copper ball to add height to the copper dome beneath. The scroll work, cross pieces and ball-bearing mounted vane are entirely hand-forged of fine quality steel and are each removably attached to the 6 foot supporting rod, the whole providing a useful as well as ornamental unit which is especially pleasing against the background of surrounding trees.

The Morris Arboretum appreciates this very personal gift of Mr. Williams.

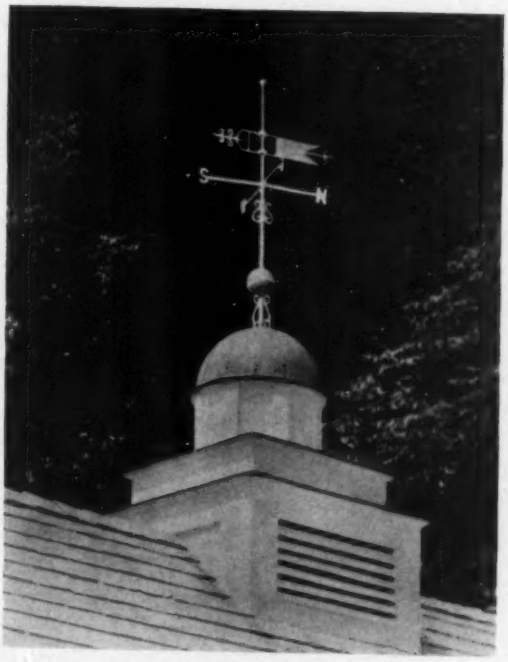

FIG. 14. The new weathervane

THE PLANT LIFE OF THE CAUCASUS

WILLIAM SEIFRIZ

Recently on reading that the Russians were defending Nalchik among the foothills of the Caucasus, memories of that picturesque town crowded into my mind. I recalled wandering through the market there in 1931. It was more than just a market. It resembled a fair in the variety of its foods and household goods, and the gaiety of its people. I asked the price of soap; six dollars a pound. Again and again I was offered all the paper rubles I could hold for my camera. The sheepskin coats made of blankets sewn together, the bright trappings, and the magnificent riding of the Cossacks all took my fancy. The men seemed to be extraordinarily fit. There is an old Russian proverb which says that Caucasian men are brave and all the women beautiful, to which there is some truth. But Nalchik was only an interlude to a strenuous botanical expedition in the Caucasus.

The Caucasian Mountains offer an extraordinary variety in plant life.[1] South of the Main Range are the luxuriant forests and fields of Svanetia. Farther south still, lie the semi-deserts of Tiflis and the sub-tropical shores of the Black Sea. In the Minor Caucasus are the garden spots of Borjom and Bakuriani, and the parched hills of Armenia. North of the Main Range is the endless expanse of the Russian steppes.

The vegetation of the North Caucasus differs greatly from that of the South. The northern slopes, from Mt. Kazbek on the east to Mt. Elbrus on the west, are rocky and precipitous, with insufficient grass for grazing. The southern provinces supply the northern ones with hay, and surpass the northern ones in wealth of forests; but the northern Caucasus have some of the finest natural flower gardens in the world.

The Caucasian flora is prolific with many endemics — species and varieties found only within this region. This is evident from the frequent occurrence of the term *caucasica;* some fifty species bear that name. There is a humorous saying among Russian botanists that when in the Caucasus if you do not know the specific name of a plant, guess *orientalis;* if wrong, then guess *caucasica* and you are certain to be right! Plants, like people, seem to have stopped there in their migratory journeys—nineteen different languages are spoken in the Caucasus. The uniqueness of plant life is due to the high barrier formed by the mountains, separating regions of wholly different climate.

On the day following my visit at Nalchik, we got into a truck and rode up the valley of the Baksan into western Balkaria, to the little village of Tegenekli at the foot of Mt. Elbrus. Elbrus is Europe's highest mountain, topping Mt. Blanc by 2500 feet.

The views into the successive valleys toward the Main Caucasus Range were exquisite. I asked my Russian friends how they thought the Caucasus compared with the Swiss Alps. "The Alps?", they replied, "a mere toy compared to the Caucasus." This is a bit of a Russian boast, for the Russians are a proud people; yet the Caucasus *are* superb.

Each valley offered a distinct botanical problem, and to a surprising extent a different flora as well. I shall describe three of them. The first was the valley of Adyl-Su with a sparse vegetation, for the glaciers descend low. Here I had opportunity to study the tree line, which in the Caucasus may be of pine, spruce, or birch.

The Caucasian pine is a problem in both taxonomy and ecology. It may be the European pine, *Pinus sylvestris,* or a variety of it known as *P. hamata,* or we may settle the problem and call it *P. caucasica.* Its distribution is also a puzzle, for in the North Caucasus it is on the southern slopes, and in the South Caucasus it is on the northern slopes.

The second of the valleys was that of Uzengi. Here was as beautiful a forest of birch as one could imagine. The trees shimmered in the sunlight like spangles on a ballet dancer's dress. If one were to choose just one tree with which to represent all Russia it would be the birch. Russian artists delight in putting the birch in their landscapes. The remarkably sharp distribution of trees in the Caucasus was again illustrated in the

[1] For a more detailed account see the writer's "Sketches of the Vegetation of Some Southern Provinces of Soviet Russia", II, III, VI, and VII, of *Ecology,* Vol. 19, 1931, pp. 372-382; Vol. 20, 1932, pp. 53-68; Vol. 23, 1935, pp. 140-160.

Uzengi Valley; birch was on the north-facing slopes and pine on the south-facing ones.

The third valley was that which leads to the western pass over the Main Caucasus Range, the Dongus-Orun, a valley of supreme beauty, headed by majestic peaks and glaciers. The vegetation

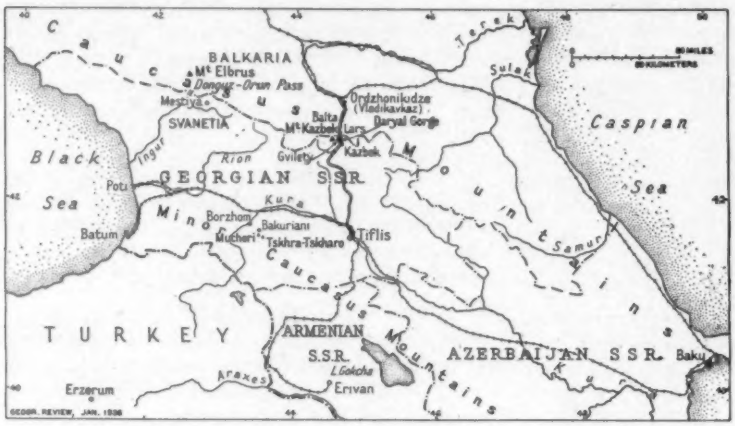

FIG. 15. Location map of the Caucasus. Scale 1 : 8,000,000

here was quite another one, a true alpine, or rather sub-alpine, flower garden in meadows of high grass. The genera are familiar to us as alpine plants, or if we are not alpinists, we know them in our rock gardens. Even the prostrate juniper is there. It is common throughout high Russian mountains, from the Caucasus to the border of Chinese Mongolia, as it is on our northern moors from the coast of Maine to Labrador. How truly alpine is this Caucasian mountain flora can be seen from the following selection:

Juniperus communis depressa
Calamagrostis arundinacea
Silene commutata
Aconitum orientale
Allium paniculatum
Alchemilla retinervis
Trifolium alpestre
Astragalus galegiformis
Viola lutea
Daphne sp.
Bistorta sp.
Polygonum alpinum
Dianthus liboschitzianus
Sempervivum pumilum
Saxifraga scleropodia
S. cartilaginea
Epilobium montanum
Gentiana caucasica
Myosotis alpestris
Ranunculus oreophilus
Alyssum murale

As we stand at the entrance to the Dongus-Orun Valley, the Main Caucasus Ridge is in front of us to the south, and beyond it the Black Sea. At our backs, to the north, lies the great Elbrus, its two peaks resting like mammoth snow-white igloos on the earth's surface. The highest is 18,347 feet above the sea.

Another day or two was spent at Tegenekli listening to old Ali tell tales of the days before the Communists, days when many old customs were rigidly kept, such as housing young girls in dark rooms for six months before marriage so as to thoroughly bleach them out for their husbands.

The slow climb up Elbrus then began. My eyes were directed ever toward the white glistening summit unaware of the more dramatic scenery at my back until I stopped to rest. There before me lay the most magnificent valley that I have ever beheld, a sublime picture of one of Nature's great masterpieces (Fig. 17).

A valley such as that of the upper Baksan illustrates well what the altitudinal distribution of plants really means. The sketch in Fig. 18 diagrams this for another Caucasian valley.

Higher still on Elbrus is mountain tundra. It carpets the little plateau known as Krugozor, close to the edge of the glaciers. Immediately below was a sub-alpine brush of *Sorbus Aucuparia*, so typical of Russian mountains, of Prunus, Salix, *Rubus saxatilis*, the ubiquitous *Vaccinium Vitis-idaea*, Berberis, *Hippophaë rhamnoides*, and Rosa. Typically, and historically, Russian tundra is high mountain moorland, not arctic lowland, but the plants on both are very similar. The tundra on the high slopes of Elbrus contains plants common to both alpine and arctic fields:

Botrychium lunaria
Dryopteris filix-mas
Avena versicolor
Carex caucasica
Crocus sp.
Gymnadenia conopea
Minuartia caucasica
Silene lychnidea
Saxifraga sibirica
Polygala alpestris
Empetrum nigrum
Daphne glacialis
Valeriana alpestris
Gnaphalium supinum
Antennaria dioica
Anthemis iberica
Draba begardes
Polygala alpestris
Veronica gentianoides
Aster alpinus
Taraxacum ceratophorum
Linnaea borealis

I had always associated *Linnaea borealis* with arctic moors. To find it so far south was a sur-

FIG. 16 (Top). The central Caucasus Range, Mt. Tetnuld at left; alpine hills in foreground covered with Rhododendron and Geranium

FIG. 17 (Bottom). Valley of the upper Baksan, approaching Mt. Elbrus, Balkaria

prise, but the reason is evident: *Linnaea borealis* thrives in the Caucasus because of altitude. Whether one travels *north* from the equator or *up* from the equator, the change in plant life is the same, from palms to arctic moors or alpine fields.

The renowned edelweiss is not found in the Cau-

casus. It skips all mountains from Switzerland to Japan, and reappears in Nippon's alpine meadows.

The valley of the Dongus-Orun, which we visited before the climb up Elbrus, is the route to one of the least known and most unreal valleys on earth, Svanetia. The only familiar country to which I can compare it is Andorra in the Pyrenees.

Svanetia is a dreamland, nestled between two high mountain ranges, and inhabited by the Svans, a people long feared by the Russians. To but briefly characterize the plant life of Svanetia would require many pages. I shall, therefore, tell of just three of my most stirring experiences there. The first occurred just over the pass where we entered the high grass, a sub-alpine vegetation. This was truly high grass. Never have I seen such tall alpine plants, with such colossal flowers. The yellow blossoms of Inula were as large as sunflowers, and the blue bells of *Campanula latifolia* were 'most large enough to ring. But the giant among the Nakra Valley herbs was Heracleum,—it towered above me to a height of twelve feet. I cannot show you a picture of this Heracleum, but you can see it in one of the finest books ever written on the Caucasus, that of Douglas W. Freshfield, superbly illustrated by Vittorio Sella.

The second impressive feature of Svanetia's vegetation is her forest of firs. Monarchs such as these leave one in awe. We slept on straw under the giant Abies after a supper of tea and shashleek.

The next morning brought us into Svanetia proper, into the valley of the Ingur. It seems almost sacrilege to pass so hurriedly through this valley of unsurpassed beauty, ignoring its forests of Populus, Fagus, Quercus, Acer, Tilia, and Juglans, which, if we are to judge by the genera, might almost be a forest in Pennsylvania. There is Ilex, Corylus, and Prunus as well—wild pears are abundant in the Caucasus. We must pass by, too, the majestic splendor of the mountains, the monolithic Ushba dominating all. One additional glimpse of the plants of Svanetia I shall give, however, on a little patch of ground high above Mestia. Mestia is a village of towers where every home has a stone fortress resembling a Campanile.

Growing within a foot of each other, on rocky ground at the edge of an alpine wood of shrubby beeches, was an association of plants typical of the far north. Here were *Vaccinium Vitis-idaea, Linnaea borealis, Empetrum nigrum, Goodyera repens,* and *Pyrola secunda,* which I had collected on the arctic moors in Russian Lapland, latitude 69°.

We leave Svanetia by the Latpar Pass. The Russians have a saying, " He who goes over the Latpar Pass in fair weather is blessed by God." From the Latpar Pass one has an unobstructed view of the Main Caucasus Range.The panorama is one of unsurpassed grandeur. The ruggedness of Shkara's rocky ridge is softened by freshly fallen snow, and the white cone of Tetnuld, the most graceful of the Caucasian peaks, glistens in all its splendor (Fig. 16). At one's back, to the south, lies the more serene pastoral landscape of Georgia.

The high alpine fields here at 10,000 feet altitude were covered with an almost pure growth of but three plants, a grass, a geranium, and a rhododendron. The geranium was *Geranium pasturus;* it covered square miles of ground. The rhododendron was *R. caucasicum.* Only one other plant did I take note of; in a slight depression on the meadows at the Pass, *Crocus flavus* was growing in extraordinary profusion.

On to Batum we went, where luscious ripe figs and airon, the healthful sour milk of Southern Russia, were a refreshing change from the heavier diet of the mountains.

The foregoing journey is a severe one and rarely taken by visiting botanists or Russians. A more comfortable trip, and almost as fine in its scenery and plant life, is that among the hills of Bakuriani in the Minor Caucasus bordering Armenia. There is not space to describe these hills in detail but I can do it botanically, and briefly, by summarizing with the aid of a sketch (Fig. 18). The figure depicts the altitudinal distribution of plants, from the valley floor at 5000 feet altitude to the ridge of Tzhra-Tzharo at nearly 10,000 feet.

No. 1 on the figure (Fig. 18) represents lowland pastures with the wild pear, *Pyrus communis,* the wild apple, *P. malus,* and an occasional wild plum, *Prunus divaricata.* Grasses and numerous Carices cover the pasture floor.

No. 2 is of lowland forests of *Ulmus elliptica, Corylus Avellana, Acer platanoides, Quercus macranthera, Alnus glutinosa,* and *Fraxinus excelsior.*

No. 3 represents lowland forests of the pine, *Pinus hamata,* and the spruce, *Picea orientalis.*

No. 4 is of the upper deciduous forest consisting primarily of the endemic maple, *Acer Trautvetteri,* with a few scattered oaks, the last beeches, and first birches. The Caucasian maple reaches the tree line in many regions of the mountains.

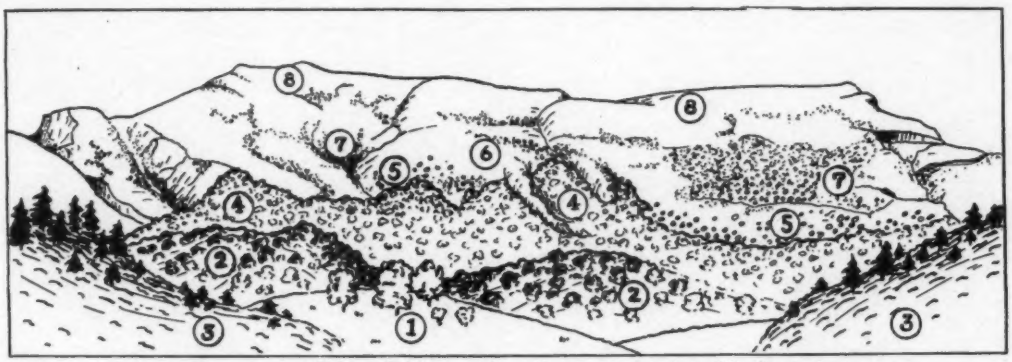

FIG. 18. Panorama of Tskhra-Tskharo, Minor Caucasus, showing altitudinal plant zones

No. 5 is the tree line; an open forest of the birch, *Betula pubescens,* if on the north slope, and *Pinus hamata* if on the south slope. If the slope is squarely to the east or west, pine and birch are intermingled.

No. 6 is of park-like fields at the tree line containing fine tall-stemmed alpine flowers such as *Campanula lactiflora, Heracleum Wilhelmsii, Podanthum campanuloides, Betonica grandiflora, Aethiopappus pulcherrimus,* and *Gentiana asclepiadea*—the tallest of the gentians.

No. 7 is a thicket of *Rhododendron caucasicum* and *Vaccinium uliginosum.*

And No. 8 is of alpine fields of short grass, Poa predominating, but Koeleria is abundant. Here grows a magnificent collection of alpine flowers with *Dianthus cretaceus, Ranunculus caucasicus, Anemone narcissiflora, Helianthemum vulgare, Aconitum anthora, Primula cordifolia, Alchemilla vulgaris, Onobrychis oxytropoides*—a typical Armenian plant,—*Trifolium canescens,* and the tiny prostrate rosaceous *Sibbaldia parviflora.*

A still more leisurely promenade—it is little more than that—is the walk, or ride, along the renowned Georgian Military Way, through the Daryal Canyon, from Tiflis to Vladicavas, or what *was* Vladicavas — Russians have changed the names of their towns so often since 1918 that one can't keep up with them. I believe Vladicavas has become Ordzhonikidze. Pronounce it if you dare!

The Georgian Military Way is famed in Russian history as the scene of many an encounter between the Russians and the Gruzini (Georgians). It is equally renowned for its magnificent scenery; the Daryal Canyon and Mount Kasbek are known by name to every Russian school child.

The Georgian Military Way has been trod not only by soldiers but by botanists. There is great diversity in habitat and, therefore, in vegetational type, from Russian steppes to lowland forest, mountain grassland, highland forest, cliff plants, sub-alpine high grass, and alpine fields. We cannot do it all, so I shall select that part which would give the greatest joy to a garden lover. It is the flower-laden, sub-alpine high grass on the slopes of Mt. Kasbek.

I had just emerged from a small woods of *Crataegus melanocarpa.* That the hawthorn could be so abundant I never realized. Clinging to the rocky crags of the canyon were dwarf forms of *Pinus hamata,* and occasional prostrate Junipers, with clumps of *Berberis georgica. Sempervivum caucasicum* flourished well, tightly rooted in rock crevices, as is the habit of this genus. There was also the delightfully jaunty *Pyrethrum partheni-folium,* a less familiar genus among the asters.

As I entered the high grass, I met a group of students from the University of Moscow and they immediately turned to collecting plants I had not yet found. These were among them:

Caryophyllaceae
Alsine imbricata
Dianthus alpinus
Minuartia imbricata
Ranunculaceae
Aconitum caucasicum
Delphinium flexuosum
Ranunculus boissieri
Papaveraceae
Papaver bipinnatum
Crassulaceae
Sedum oppositifolium
Sempervivum caucasicum
Saxifragaceae
Parnassia palustris
Rosaceae
Fragaria elatior
Rosa dumetorum
Rubus idaeus
Leguminosae
Medicago glutinosa
Geraniaceae
Geranium pyrenaicum
Thymelaeaceae
Daphne glomerata
Umbelliferae
Astrantia biebersteini
Ericaceae
Vaccinium Vitis-idaea
Oleaceae
Ligustrum alatum
Gentianaceae
Gentiana asclepiadea
Labiatae
Betonica grandiflora
Mentha silvestris
Dipsacaceae
Cephalaria procera
Campanulaceae
Campanula collina
Compositae
Centaurea dischori
Doronicum macrophyllum
Inula helenium
Pyrethrum parthenifolium
Solidago virga aurea
Swertia iberica

One of the loveliest of the blossoms was that of *Scabiosa caucasica.*

Higher, in the crevice of an exposed rock, was the sprightly *Campanula tridentata* (Fig. 13). It might well be chosen as symbolic of the ruggedness and beauty so perfectly combined in the Caucasian Mountains.

NOTES FROM THE LABORATORY

Spray Results

Nicotine on Larch Case Bearer.—In the past, arsenate of lead has been relied on to control heavy infestations of this pest (*Coleophora laricella*) on the American Larch (*Larix laricina*) at the Arboretum. This has meant two and sometimes three spray applications over a three-week period to keep the new foliage covered and protected against the larvae. For the first time at the Arboretum a contact insecticide was used last spring. Nicotine and C. P. O. (1–2–800) was the application made on the 17th of April—at which time the trees were beginning to "green" and the larvae becoming active. This single spray completely controlled a very severe infestation on all the larch.

Arsenate on Cypress Tip Moth.—Recurvaria apicitripunctella, which is a serious pest on the bald cypress (*Taxodium distichum*), but does not attack the pond cypress (*T. ascendens*), has been readily controlled with an arsenate of lead spray. Applications at the time of "greening" and again ten days later were sufficient. Of contact sprays, nicotine was found to be impractical in that any dosage heavy enough to control the insect caused severe burning of the foliage. "Lethane 440" caused no burning, but its insecticidal value on this insect was not completely satisfactory.

Yellow Cuprocide on Pine, Hawthorn, Rose, and Calycanthus.—For the past two seasons this spray (1½-100) has been used as a control of the *Sphaeropsis* tip blight on the pines. Results, while not so consistent as with Bordeaux, have been satisfactory. However, foliage burning, and in some cases complete defoliation, was found on some smaller plants, namely, Azaleas, *Pyrus japonica,* Enkianthus spp., and *Osmunda regalis,* which were affected by the spray drip from the pines.

English hawthorn, which had been sprayed for leaf-spot with Bordeaux with excellent results a year ago (*Morris Arb. Bull.,* Vol. 4, No. 1), was sprayed with Cuprocide during the past season. Results, while satisfactory, were not so favorable as with the former.

An *Alternaria* leaf spot of the Carolina Allspice (*Calycanthus floridus*) has been almost completely controlled with Cuprocide used in mid-May, first of June, and mid-June.

At the rate of 2⅓ ounces of Cuprocide to 100 gallons, black spot of roses has been kept under control by spraying every two weeks.

SPENCER H. DAVIS, JR.